

CLAIMS

[1] A vehicle surrounding display device which selectively displays at least two types of images in a vicinity of a vehicle, the vehicle surrounding display device comprising:

5 a measurement section for measuring a distance and a direction from the vehicle to an obstacle in the vicinity of the vehicle;

a comparison section for comparing the distance measured by the measurement section with a predetermined threshold value;

10 a viewpoint determination section for determining a predetermined first viewpoint when a comparison result generated by the comparison section indicates that the measured distance is larger than the threshold value, and for determining a second viewpoint based on the direction measured by the measurement
15 section when the comparison result generated by the comparison section indicates that the measured distance is not larger than the threshold value;

an image generating section for generating, when receiving the first viewpoint from the viewpoint determination section, a
20 first image representing a view in the vicinity of the vehicle as seen from the received first viewpoint, and for generating, when receiving the second viewpoint from the viewpoint determination section, a second image representing a view of the vehicle and the obstacle as seen from an area in the vicinity of
25 the received second viewpoint; and

a display section for displaying one of the first image and the second image generated by the image generating section.

[2] The vehicle surrounding display device according to claim 1,

5 wherein

the first viewpoint and the second viewpoint are represented by three-dimensional coordinate values, respectively, a horizontal direction component of the second view point is larger than a horizontal direction component of the first viewpoint, and
10 a vertical direction component of the second viewpoint is smaller than a vertical direction component of the first viewpoint.

[3] The vehicle surrounding display device according to claim 2, wherein

15 the three-dimensional coordinate values of the first viewpoint are set at a point which is above the vehicle and,

the three-dimensional coordinate values of the second viewpoint are set at a point having a predetermined depression angle which is formed between the horizontal plane and a line
20 extending from the second viewpoint in a direction of the vehicle and the obstacle.

[4] The vehicle surrounding display device according to claim 3, wherein

25 the second viewpoint is set at a point contained in a vertical

plane orthogonal to a line between the vehicle and the obstacle.

[5] The vehicle surrounding display device according to claim 4,

5 wherein

the vertical plane is a plane which perpendicularly bisects the line between the vehicle and the obstacle.

[6] The vehicle surrounding display device according to claim 1,

10 further comprising a contact determination section for determining whether the vehicle is capable of moving without contacting the obstacle, wherein

when the contact determination section determines that the vehicle is capable of moving without contacting the obstacle, the display section displays a third image different from the second image.

[7] The vehicle surrounding display device according to claim 6,

wherein

20 the measurement section further measures a height of the obstacle, and

the contact determination section determines whether the vehicle is capable of moving without contacting the obstacle based on the height of the obstacle.

[8] The vehicle surrounding display device according to claim 6, further comprising a steering angle detecting section for detecting a steering angle of the vehicle, wherein

the contact determination section determines whether the vehicle is capable of moving without contacting the obstacle based on the steering angle detected by the steering angle detecting section.

[9] The vehicle surrounding display device according to claim 8, wherein

when the contact determination section determines that the vehicle is capable of moving without contacting the obstacle, the viewpoint determination section additionally determines the second viewpoint based on the steering angle detected by the steering angle detecting section.

[10] The vehicle surrounding display device according to claim 9, wherein

the second viewpoint is set at three-dimensional coordinate values such that a driver can visually recognize both the obstacle and a spot, on the vehicle, which contacts the obstacle.

[11] The vehicle surrounding display device according to claim 1, further comprising a selecting section for selecting, when the measurement section measures a plurality of distances and

directions of obstacles, one distance and one direction, which are most likely to contact the vehicle, wherein

the comparison section compares the distance selected by the selecting section with a predetermined threshold value, and

5 the viewpoint determination section determines the second viewpoint based on the direction selected by the selecting section, when the comparison result generated by the comparison section indicates that the measured distance is not larger than the threshold value.

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[12] The vehicle surrounding display device according to claim 1, comprising a plurality of active sensors mounted at any of a front part, a rear part, a right side part or a left side part of the vehicle, wherein

15 each of the active sensors detects for an obstacle in the vicinity of the vehicle.

[13] A vehicle surrounding display method for causing a display device to selectively display at least two types of images in a vicinity of a vehicle, the vehicle surrounding display method comprising:

20 a measurement step of measuring a distance and a direction from the vehicle to an obstacle in the vicinity of the vehicle;

a comparison step of comparing the distance measured by the measurement section with a predetermined threshold value;

25

a first viewpoint determination step of determining a predetermined first viewpoint when a result received from the comparison step indicates that the measured distance is larger than the threshold value;

5 a first image generating step of generating a first image representing a view in the vicinity of the vehicle as seen from the first viewpoint determined by the first viewpoint determination step;

a first display step of displaying the first image generated
10 by the first image generating step;

a second viewpoint determination step of determining a second viewpoint based on the distance measured by the measurement step when a result received from the comparison step indicates that the measured distance is not larger than the threshold value;

15 a second image generating step of generating a second image representing a view of the vehicle and the obstacle as seen from an area in the vicinity of the second viewpoint determined by the second viewpoint determination step; and

a second display step of displaying the second image
20 generated by the second image generating step.

[14] A computer program for causing a display device to selectively display at least two types of images around a vehicle, the computer program comprising:

25 a measurement step of measuring a distance and a direction

from the vehicle to an obstacle in a vicinity of the vehicle;

a comparison step of comparing the distance measured by the measurement section with a predetermined threshold value;

a first viewpoint determination step of determining a
5 predetermined first viewpoint when a result received from the comparison step indicates that the measured distance is larger than the threshold value;

a first image generating step of generating a first image representing a view in the vicinity of the vehicle as seen from
10 the first viewpoint determined by the first viewpoint determination step;

a first display step of displaying the first image generated by the first image generating step;

a second viewpoint determination step of determining a second
15 viewpoint based on the distance measured by the measurement step when a result received from the comparison step indicates that the measured distance is not larger than the threshold value;

a second image generating step of generating a second image representing a view of the vehicle and the obstacle as seen from
20 an area in the vicinity of the second viewpoint determined by the second viewpoint determination step; and

a second display step of displaying the second image generated by the second image generating step.